

# Game Theory and Motivation among Enterprises and Employees, a Key to Human Resource Management

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## Abstract

Motivation of employees is a vital measure in human resources management which helps enterprises to promote the realization of the enterprise goals by improving employee motivation. Promotion and salary increase are the most widely used incentive means. If salary increase and promotion are used efficiently, they can achieve twice the result with half the effort, which is conducive to the enterprise to build a standard, and reasonable structure of the staff. An enterprise is usually a group made of many people. The game between the employer and the employees exists at all time. In the management process, the employer as well as the enterprise should consider how to balance the relative factors of all aspects to make the best management effects. The application of motivation to balance the advantage and the disadvantage can solve some problems in human resource management. This paper analyses the game theory behavior of enterprises and employees under different strategies of salary increase and promotion, and recommends that enterprises should maintain the average level of wage growth in the market, increase salary moderately in the stage of rapid economic growth, and attach importance to the needs of highly skilled and talented employees, so as to provide some reference for human resources management of enterprises.

## Keywords

Motivation • Game theory • Enterprises • Employees

## Introduction

In all organizations, motivation is what drives employees towards achieving their goals, organizational goals and also the dreams of a nation. It is the study of interactive decision-making by rational decision makers. Game Theory is the study of interactive human behavior in which incentive structure and the institutional environment matter. Motivation can be defined as a pleasurable or positive emotional state resulting from the appraisal of one's job experiences. Motivation theory examines people's needs and motivations or incentives. It examines how to push and strengthen people's behavior through external stimulation. Motivation theories, such as Maslow's hierarchy of needs theory, McClelland's achievement needs theory, Herzberg two factor theory and Vroom's expectation theory, have studied human's demand for motivation/ incentives from different levels and angles. Efficient use of incentive or motivation theory in enterprises can effectively guide and guard employees' behavior and make it consistent with the strategic direction of enterprises as far as possible, which is conducive to promoting the realization of the enterprise goals. Incentive measures to employees include competitive income, granting necessary power, arranging satisfactory work content, creating a harmonious working atmosphere, giving corresponding personal honors, ensuring the safety and comfort of working environment, and formulating scientific and reasonable management system. We also have the traditional form of incentive which includes "salary increase and promotion", which are the most commonly used incentive means for enterprises. If this is used properly, it will increase the enthusiasm, zeal and initiative of employees and benefit enterprises.

However, the application of these two incentive policies is not synonymous. Some enterprises tend to enhance employee loyalty through positive incentives, while some are conservative and accustomed

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to controlling the intensity and frequency of employee incentives from the perspective of cost savings. Others are good at adjusting specific strategies according to the actual situation of employees. How to achieve the maximum benefits of enterprises and the ultimate goal of employee incentive is one of the important goals of human resource management in organizations and the world at large. The human resource management is to arouse to the maximum the activity of every employee. The staff management is the chief problem in enterprise management. Under the new condition in which modern economics develop quickly, the human resource management cannot be simply concluded as the relation of obeying and being-obeyed as in the past. Only to manage sensibly and scientifically after fully considering all aspects of factors, can make real effects in the human resource management and provide powerful guarantee. An enterprise is usually a group made of many people. The game between the employer and the employees exists at all time. In the management process, the employer as well as the enterprise should consider how to balance the relative factors of all aspects to make the best management effects. The application of motivation to balance the advantage and the disadvantage can solve some problems in human resource management. This paper analyses the game theory behavior of enterprises and employees under different strategies of salary increase and promotion, and recommends that enterprises should maintain the average level of wage growth in the market, increase salary moderately in the stage of rapid economic growth, and attach importance to the needs of highly skilled and talented employees, so as to provide some reference for human resources management of enterprises.

## Objective of the study

These are the following objective for the study:

- To examine the various ways by which employers can motivate employees.
- To examine how game theory can be applied to motivate both employees and employers.
- To discover if incentives enhances employees productivity.

## Justification of the study

The relevance of this research is that it helps to ascertain how game theory can be applied in the motivation of employees by employers in an organization. It also provides information on what motivates both employers and employees.

However, the study will be importance to the following categories:

**Government (policy makers):** The government will benefit from the study since it will provide the basics for making policy changes and formulating future policies. It helps the economy in planning for development.

**Researchers:** The study is important to students since it will reveal more details and provide more information for those who are interested in finding out how to motivate employees in order to ensure maximize profit.

**Firms:** This will enable firms to know how to motivate their workers/employees so that they can get more profit and leads to effective management of the firm.

## Literature review

**Theoretical framework:** First of all, it is essential to discuss the theoretical connection through which employees' compensation growth is expected to follow productivity increases. Cassell represents a good overview of the theory behind employees' productivity and wage growth. He starts by considering the behavior of an individual firm which operates in a competitive economy and has a little influence in market conditions. That firm sells its goods at prevailing prices and hires workers at prevailing wages. The economic model used in this case is "diminishing marginal productivity" which suggests that each additional worker hired is less productive than those hired before [1]. The reason behind this assumption is that it is the best interest of a firm to hire the most capable workers, implying that each additional worker is less productive and as well without additional investment in capital each additional worker reduces the ratio of capital per worker. A profit-maximizing firm will continue to add to its labor force as long as the contribution to output produced by the last worker hired (the price of the good times the quantity produced) exceeds the cost of his/her labor (the wage rate times hours worked). Conversely, when the value of the output of the last worker hired equals the cost of the additional labor, the profit-maximizing firm will stop to add to its labor force.

Assuming that a technological innovation raises the productivity of employees at the company, meaning that now each employee can produce more than before, then the value of the output will rise so that the additional worker hired that produces more than enough can cover the cost of his/her labor. If the firm continues hiring as long as the value of output by the last worker hired is higher than the additional labor cost, the growth in productivity will increase the firm's demand for labor as it brings profit to the firm. All other things being equal, an increase in the demand for labor will lead to push up the wage rate. In that case, the rise in productivity will increase labor income on the part of the employer [2]. Nevertheless, the firm will stop hiring when it reaches the point where the cost of labor become greater or equal to the contribution to the output produced by the additional worker hired.

It is important to note that under some circumstances a growth in productivity might not necessarily cause an increase in employment. Take as an example a case where labor productivity rises more quickly than does demand for the goods workers produce since the supply of the good being produced rises relative to the demand for that good in which the price of the good tends to decline. As a result, the fall in price will offset the effect of higher productivity on the value of goods produced by employees. As long as the drop in price becomes equal to a rise in productivity, there will be no change in the value of each additional worker's production to the firm and therefore, the demand for labor will not increase - the firm neither hires more employees nor increases wages. In this case, all of the benefits of higher productivity are captured by consumers who take advantages of the same quality and quantity of the goods at a discounted price [3]. However, it is worth to mention that the fall in price of one product creates the opportunity for consumers to spend more on all other goods and services. As these price dynamics lead to an increase in demand of other goods, prices for those goods will rise. Interestingly enough, the demand for labor at firms producing those goods increases as well. Consequently, that increase in demand will tend to drive up employment and compensation at those firms.

## Materials and Methods

### Maslow's hierarchy of needs

Maslow theory state the fact that people want to increase what they

want to achieve in life and their needs are set according to the order of priority. According to Maslow, the content theories of job satisfaction revolve around employees' needs and the factor that brings reasonable degree of satisfaction. Maslow's came up with the five stage theory that groups the needs of individual's according to the order of priority. These categories are:

- Physiological needs (food, shelter, clothing)
- Safety and security needs (Physical protection)
- Social needs
- Esteem needs (getting acknowledgement from others)
- Self-actualization needs (the wish to leave behind a legacy)

When a graduate takes a job, he will feel satisfied if the enterprise can make his learning to meet practical needs and the remuneration is very attractive. He might later want to gain higher salary when he considers the problem of how to improve his standard of living or his marriage. If his enterprise cannot meet his needs he will start taking steps towards getting a better job. The various needs of the staff in different stages should be considered fully in the human resource, and the corresponding solution should be taken to make the best management effects and to arouse the enthusiasm of the staff to the maximum.

### Herzberg's motivator hygiene

This is also called the Two-factor theory, this originated from a research carried out among accountants and engineers to examine what makes people feel good or bad about their job. Herzberg observed that there were five characteristic of work that brings about satisfaction, namely; achievement, the job itself, responsibility, recognition and advancement. According to kaswuri, Agashahi and Ismail, they opined that an organization uses the Herzberg theory to create opportunities for personal growth, enrichment and recognition among their employees [4-6]. He also said employees should be promoted after completing certain stages of their career and should be awarded for special achievement.

### Mcclelland's need achievement theory

This theory opines that some people are driven to success through seeking personal achievement rather than rewards themselves. This theory is applicable in academics and it explains the reason why some lecturers are high achievers, despite the difficulties they face: they set high goals and how to achieve this goal is what drives them.

### Vroom's expectancy theory

Vrooms' theory stipulates that behavior is a product of choices that are available for prioritization. The idea behind this concept is to derive satisfaction and reduce dissatisfaction in employees. This theory explains that performance, motivation, and effort are within an individual's motivation and variables such as expectancy verifies this.

## Results

### Application of game theory

**Game theory analysis of enterprises and employees:** Assuming that both enterprises and employees are rational people, the purpose of pursuing is to maximize profits, that is, enterprises pursue maximization of profits and employees pursue maximization of personal utility/ satisfaction. The average market wage rate available to employees will continue to rise with the accumulation of their work experience. Employees are divided into two categories:

- Low-competence employees and
- High-competence employees.

Low competence employees can be competent for general jobs, and high-competence employees can be competent for higher positions. Only

those who show high-competence in their job, in general positions can be adjusted to higher Position. The game between enterprises and employees is a dynamic game of perfect information, which indicate that, the actions of enterprises and employees do not occur at the synonymously, the latter actors can accurately understand the strategies and benefits of the former actors, and the two sides can accurately observe the occurrence of exogenous events.

**Game theory analysis of pay increase:** The dynamic game between enterprises and employees for salary increase can be divided into three stages.

- In the first stage, the salary of employees entering the enterprise is the market average level of W1. At this time, employees have two kinds of action strategies, one is not to work hard, and the other is to work hard.

- In the second stage, after employees have worked in the enterprise for a period of time, the enterprise will take the next step. First, according to the market conditions, employees will increase their wages to W2 at least. At this time, employees will stay in the enterprise to work, and second, they will not increase their wages.

- In the third stage, if the enterprise does not increase wages, employees have two kinds of action strategies, namely, not job-hopping, and second, job-hopping to other enterprises whose wage level reaches W2.

Assuming that the employee's choice of whether to work hard or not remains unchanged after job-hopping, while the enterprise needs to re-recruit employees, assuming that the probability of new recruits working hard and not working hard is equal, the recruited new employees' salary is still W1 [7-10]. Through the analysis, we can see that there are six kinds of action strategy combinations between employees and enterprises, including employees do not work hard, the normal salary increase of enterprises; employees do not work hard, enterprises do not raise salaries, employees change jobs; employees do not work hard, enterprises do not raise salaries, employees do not change jobs; employees work hard, enterprises raise

salaries; employees work hard, enterprises do not raise salaries; employees work hard, enterprises do not raise salaries, employees Job-hopping; Employees work hard, enterprises do not raise salaries, employees do not change jobs [11-13]. Therefore, the perfect dynamic information game model of employees and enterprises can be constructed, as shown in the game tree in Figure 1. According to the hypothesis, both employees and enterprises are rational, and the sub game refined Nash equilibrium is the best strategy choice.

The profits of both sides in each stage are as follows:

$$X_{11}=W_2-C_1, Y_{11}=B_1-W_2, X_{12}=W_2-C_2, Y_{12}=B_2-W_2$$

$$X_{21}=W_2-C_2-H_1, Y_{21}=0.5(B_1+B_2) W_1-P, X_{22}=W_1-C_1, Y_{22}=B_1-W_1$$

$$X_{23}=W_2-C_1-H_2, Y_{23}=0.5(B_1+B_2) W_1-P, X_{24}=W_1-C_2, Y_{24}=B_2-W_1$$

Among them, C<sub>1</sub> and C<sub>2</sub> are the costs that employees pay for not working hard, such as time and energy; B<sub>1</sub> and B<sub>2</sub> are the benefits that employees create for enterprises when they do not work hard. H<sub>1</sub> and H<sub>2</sub> are the cost of job-hopping for employees who do not work hard, while P is the cost of recruitment and training for employees who are re-recruited by enterprises C<sub>1</sub><C<sub>2</sub>, B<sub>1</sub><B<sub>2</sub>, W<sub>1</sub>< W<sub>2</sub>, C<sub>1</sub><W<sub>1</sub><B<sub>1</sub>, C<sub>2</sub><W<sub>2</sub><B<sub>2</sub>, H<sub>1</sub><H<sub>2</sub>, H<sub>1</sub>, H<sub>2</sub> and P are actually categories of natural selection, but they are used as criteria for analysis. According to the reverse induction method, we can get the refined Nash equilibrium of H<sub>1</sub>, H<sub>2</sub> and P in different situations (Table 1).

**Game analysis of promotion:** After employees have worked in the enterprise for a certain period of time, both the enterprise and the employees themselves have learned about their ability information. For low-competent employees, enterprises only need to provide market-oriented wage levels; in this case, low-competent employees will not take the exit strategy. For highly competent employees, the dynamic game between enterprises and employees can be divided into two stages. The employees can either work hard or work lazy, while the employer decides to promote or not promote (Figure 2).

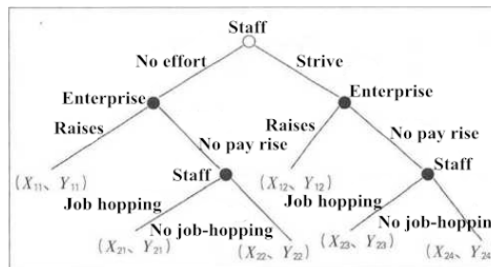


Figure 1. Game model of employees and enterprises.

Table 1. Game model between employees and enterprises.

P	H1 and H2	Employees	Enterprises	Employees	Game result
P>dW+0.5 dB		No effort	Raises		W2-C1,B1-W2
P>dW-0.5dB P<dW+0.5 dB	H1>dW>dC	Strive	Raises		W2-C2,B2-W2
	H1>dW,dW<dC	No effort	No pay rise	No job hopping	W1-C1,B1-W1
	dW>H1>dC	Strive	Raises		W2-C2,B2-W2
	dW>H1,dC>H1	No effort	No pay rise	Job hopping	W2-C1-H1 0.5(B1+B2)-W1-P
P<dW-0.5dB	H2<dW<H1	Strive	No pay rise	Job hopping	W2-C2-H2
	H2<dW-dC				0.5(B1+B2)-W1-P
	dW-dC<H2<dW<H1	No effort	No pay rise	No job hopping	W1-C1,B1-W1
	H1<dW,H1-H2<dC	Strive	No pay rise	Job hopping	W2-C2-H2
	H1<dW,H1-H2<dC	No effort	No pay rise	Job hopping	0.5(B1+B2)-W1-P W2-C1-H1 0.5(B1+B2)-W1-P

Note: DW denotes W1-W2, dB denotes B2-B1, dC denotes C2-C1.

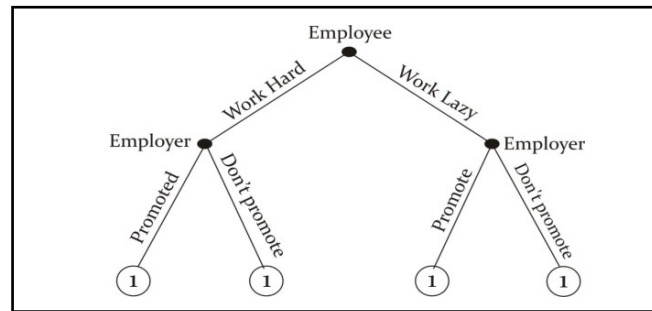


Figure 2. Game analysis of promotion.

## Discussion and Conclusion

This analysis shows that the comparison between enterprises and employees decides the equilibrium of the games of pay increase and promotion. When enterprises' cost is low, neither pay rise nor promotion occurs. On the other hand, when employees' cost is low, they will not choose job hopping unless the enterprises do not give them pay rise. This shows that the enterprises hold a stronger and more active position in the negotiation between these two parties. The implication of this analysis is that regulators should help employees to obtain a better position in such negotiations, in order to introduce more competition to the labor market. This is not only good for the employees and the enterprises since they will have more free employees to choose from. However, when there is economic growth, enterprises should give pay rises more often, or they face the risk of losing high-level employees. In reality, it is difficult to accurately calculate the income  $B$ , the recruitment and training cost  $P$  and the job-hopping cost  $H$  of employees for enterprises. The different utility functions of employees also determine the cost of their work which varies from person to person. In addition, to the flexibility of enterprise wage policy, the nature of work in different industries, the voice of trade unions in enterprises, the external policy environment and the economic cycle will all have an impact on the behavior of both sides. Therefore, the game model between enterprises and employees is not a simple perfect information dynamic game. However, the above game model still has some guiding significance for human resource management of enterprises. Employees' competency information is not completely transparent in recruitment, but through the design of effective recruitment topics, they can still have a certain degree of understanding. Enterprises should not be too rigid when recruiting. They should consider the matching degree between the employee and the nature of the post, and use different recruitment strategies. It is difficult for enterprises to retain talents if they blindly hope to recruit employees with strong comprehensive abilities without considering the actual positions that can be arranged.

Enterprises cannot fundamentally save expenditure by limiting employee wage growth, because it is easy to make employees flow to higher-income enterprises, while the original enterprises will pay additional recruitment costs and training costs, but also bear the hidden costs of product or service quality fluctuations caused by the unstable workforce, as well as the loss of corporate reputation. It may even affect the implementation of enterprise development strategy. Establishing a scientific and reasonable incentive and restraint mechanism is one of the most effective measures for enterprises to mobilize the enthusiasm of employees. By differentiating between hard-working and hard-working employees in terms of income, incentive policies can be brought into full play so that both enterprises and employees can get the greatest benefits, thus realizing Pareto optimum. If it can be promoted in all enterprises, it can significantly improve social productivity, but also make the job-hopping strategy of a few employees who do not work hard invalid, which is more conducive to the stability of the staff. According to the traditional incentive theory, employees will have higher-level needs after their salaries meet their living needs, such as hope that their abilities will be recognized by others, hope to control more resources and challenge more difficult work. Therefore, it is another effective incentive for enterprises to arrange promotion for high-competent employees at the right time. It can achieve more scientific resource allocation, further enhance the satisfaction and belonging of employees, and enterprises will

often get higher returns. In enterprises where promotion opportunities are scarce, employees are generally lack of vitality because they cannot see the channels of promotion, and highly competent employees are more likely to be lost. Job-hopping costs of employees and recruitment and training costs of enterprises are important factors affecting the decision-making of both sides. When the economic growth rate is faster and the demand for labor is greater than the supply, the cost of job-hopping is lower. At this time, enterprises should keep wage growth slightly faster than the average level of the market to reduce the rate of employee turnover. For key positions with certain technical or experience barriers, the cost of recruitment and training is high. Therefore, we should make full use of all kinds of incentives to stabilize the work of these employees.

## References

- Axelrod, Robert and William Donald Hamilton. "The Evolution of Cooperation." *Science* 211 (1981): 1390-1396.
- Bradfield, Ronald M. "Cognitive Barriers in the Scenario Development Process." *Adv Dev Hum Resour* 10 (2008): 198-215.
- Bratton, John, and Jeff Gold. "Human Resource Management: Theory and Practice." Palgrave 6th Edition (2017): 1-643.
- Golshan, Nargess Mottaghi, Aznur Hafeez Kaswuri, Betsabeh Aghashahi, and Muslim Amin, et al. "Effects of Motivational Factors on Job Satisfaction: An Empirical Study on Malaysian Gen-Y Administrative and Diplomatic Officers." *J Adv Manag Sci* 19 (2011): 1-7.
- Camerer, Colin F. "Progress in Behavioral Game Theory." *J Econ Perspect* 11 (1997): 167-188.
- Chermack, Thomas J. "Assessing the Quality of Scenarios in Scenario Planning." *J Futures Stud* 22 (2006): 1-13.
- Chermack, Thomas J, and Richard A Swanson. "Scenario Planning: Human Resource Development's Strategic Learning Tool." *Adv Dev Hum Resour* 10 (2008): 129-146.
- Crawford, Vincent P. "Theory and Experiment in the Analysis of Strategic Interaction." *Econom Soc Monogr* 26 (1997): 206-242.
- Fudenberg, Drew, and David K Levine. "Consistency and Cautious Fictitious Play." *J Econ Dyn Control* 19 (1995): 1065-1089.
- Gilley, Jerry, and Ann Maycunich. "Beyond the Learning Organization: Creating a Culture of Continuous Growth and Development through State of the Art Human Resource Practices." *Basic Books* 1(2000): 1-384.
- Hill, Charles WL. "Cooperation, Opportunism, and the Invisible Hand: Implications for Transaction Cost Theory." *Acad Manage Rev* 15 (1990): 500-513.
- Roger, McCain. "Game Theory: A Non-Technical Introduction to the Analysis of Strategy." *East Econ J* 39 (2013): 265-267.
- Saif, Saifuddin Khan, Allah Nawaz, Farzand Ali Jan, and Muhammad Imran Khan. "Synthesizing the Theories of Job Satisfaction across the Cultural/Attitudinal Dimensions." *Am Int J Contemp Res* 3 (2012): 1382-1396.

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